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Title: METHOD FOR THE MANAGEMENT OF TIME IN A MOBILE TELEPHONE

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METHOD FOR THE MANAGEMENT OF TIME IN A MOBILE TELEPHONE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to a method for the management of time in a mobile telephone. It can be used especially in mobile telephones working according to the GSM standard. One of the aims of the invention is to give a user the time in a way that automatically takes account of the time situation in which he or she is located. This providing of the time essentially comprises a display of the current time. However, it can also be used to reset appointments recorded in an electronic diary proposed as a functional accessory of a mobile telephone, especially when the user undergoes time zone changes. An aim of the invention therefore is to set a time in use, or a time displayed on the screen of a mobile telephone, according to a geographical zone in which the mobile telephone is located.

2. Description of the Prior Art

In the field of mobile telephones, there presently exists a known method of time management. There are also ways of setting a time displayed on a screen of a mobile telephone. This setting is done by hand by a user. In the field of microcomputers, there are also known ways of taking account of a possible change in summer/winter time depending on the country in which a microcomputer is located. In order to enable the management of this change in time, a microcomputer of this kind possesses a piece of calendar information pertaining to a current season.

The methods of time management currently used pose a number of problems. Indeed, a first problem appears when a user provided with a mobile telephone goes abroad. More specifically, the problem arises if the user moves over a sufficiently great distance so that he moves from a region covered by one time zone to a region covered by another time zone. Thus, if the user wants his mobile telephone to display the correct time on its screen, he must make the necessary modifications by hand. To this end, he must know the time difference that applies to the geographical region in which he is located. This is a painstaking task and requires knowledge that it is sometimes difficult to possess.

A user may travel over great distances. These distances may be so great that the user will go across several regions, each covered by a different time zone. In this case, the user must repeat this operation at each step. Then, when he returns to his country of origin, the user must again adjust his device in order to have the right time displayed on the mobile telephone.

Furthermore, a user in a country other than his own may encounter a different problem. Indeed, if he comes from a country that takes account of a change between summer time and winter time, then his mobile telephone may be programmed to take account of the change. If the country in which the user is located is not concerned by this kind of change between summer time and winter time, then a problem arises. Indeed, for the management of the time in his mobile telephone, everything happens as if his mobile telephone were in a country for which it had been programmed. At a planned date of a change in time between summer and winter, the time displayed on a screen of the mobile telephone would be modified. Consequently, the time displayed by the mobile telephone would be wrong. It would have to be changed by hand.

It is an object of the invention to overcome the above-mentioned problems by proposing a method for the automatic management of time, especially the time displayed on a screen of the mobile telephone. In the invention, the setting is made as a function of a measurement of a time zone in which the mobile telephone is located. Indeed, it is not a geographical region in which the mobile telephone is located that is taken into account but a geographical region in which there is a base station linked with this mobile telephone. This base station manages a cell in which a mobile telephone is located. It is accepted in the invention that a base station with which the mobile telephone is connected is in a region covered by the same time zone as the one covering the region in which the mobile telephone is located. The measurement of the time zone is then done by means of a piece of identification information sent by this base station to the mobile telephone.

It is indeed known that a mobile telephone receives information sent by base stations relating to the operator of the mobile telephony network, the country and the identity of the base station linked with the mobile telephone. This information is normally used for the display, on a screen of the mobile telephone, of the name of an operator of a telephone network with which the

mobile telephone is connected. To make this possible, the mobile telephone has a table in memory comprising names of countries with names of operators as well as country codes and operator codes. In the table, a country name corresponds to a country code. In the table, an operator name corresponds to the operator code. Thus, when a country code and an operator code are received, a search is made, in the table, for the name of the country and of the corresponding operator, and the operator's name may be displayed.

In the invention, the setting of the displayed time or the useful time is then done automatically. In the invention, to make a time zone measurement, identification information elements sent by a base station of a network managed by an operator and located in a country are used. These identification information elements are transmitted to the mobile telephone whenever this mobile telephone is connected to a network. The mobile telephone, according to the prior art, can even receive this identification information when it is in a standby state. A standby state is a state in which a mobile telephone is placed after a user has entered his personal code (known as a PIN code or personal identification number) before he starts communicating with another partner. This personal code is used to unlock access to the different functions available in the mobile telephone. As opposed to a standby state, an active state is a state in which a mobile telephone is located when its user is in communication. The mobile telephone thus periodically, depending on the prior art, receives these identification information elements when the mobile telephone is connected to a network and is in a standby state. It can also receive information when it is in communication.

These identification information elements can be sent by using a transmission medium that is a signal at a frequency known as a beacon frequency that is identical for a set of base stations. The frequency channel related to this beacon frequency is called a BCCH or Broadcast Control CHannel. It is in this channel that the identification information elements are preferably broadcast.

This identification information is used, in the invention, to geographically locate a cell and, therefore, a base station. According to the invention, a user going from a region covered by one time zone to a region

covered by another time zone will see the time that is displayed on the screen of his mobile telephone change automatically as soon as there is a change in cell. This change will occur when this user goes from a cell of the network located in a region covered by a first time zone to a cell of the network located in a region covered by a second time zone.

During a connection to a new base station, the mobile telephone will receive new identification information. This new identification information, after it is interpreted in the mobile telephone, provides knowledge of the geographical position and therefore the time zone of the new base station connected to the mobile telephone. There is thus access to a value of time difference that must be added to an internal clock of the mobile telephone so that the time displayed or used is the right time.

This interpretation of information received is made possible by the creation of a correspondence table in a memory of the mobile telephone. By way of an improvement, a piece of information contained in this correspondence table even makes it possible to know if the country in which the user is located is subject to a summer/winter time change. If the user is located in such a country, the time will be reset once again, this time depending on the season, so that the user is in summer time or winter time.

According to a preferred embodiment, the correspondence table of the mobile telephone also has two other types of information. These two other types are used in the case of a country that has several time zones. A first piece of information of these two pieces of information is used, in a test, to find out if a country has several time zones. If this is the case, then a second piece of information is used. This is a geographical localizing piece of information. It will be contained, according to the invention, in a piece of identification information known as an LAC-CI type of information. The term "LAC-CI information" means Location Area Code-Cell Identity. In practice, the LAC-CI information is transmitted in more complete messages. These messages are more complete and are known as CGI. They contain a field for a country code, a field for an operator code and a field for the LAC-CI identification of a base station.

With all this information, it is possible, in the correspondence table, to identify time difference information that can be used to obtain the right time. Thus, the time difference to be applied to an internal reference time of the

mobile telephone will be known. Preferably, this reference time is a time that is not affected by any time difference.

SUMMARY OF THE INVENTION

The invention therefore relates to a method for the management of time in a mobile telephone comprising the following steps:

- a binary message representing the time is produced,
- this binary message is used, or displayed on the screen, in an understandable form to make it useful or visible to a user,

wherein:

- the useful or displayed time is set automatically as a function of a measurement of a time zone in which the mobile telephone is located.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be understood more clearly from the following description and the appended figures. These figures are given purely by way of an indication and in no way restrict the scope of the invention. Of these figures:

- Figure 1 shows a view of the means used to implement the method for the management of displayed time according to the invention. These means are contained in a mobile telephone that itself is not shown;
- Figure 2 is a diagrammatic view of a distribution of mobile telephone operators in two countries, one of which is covered by three time zones and the other by a single time zone;
- Figure 3 is an illustration of a sequencing, in algorithm form, of different steps of the method according to the invention.

MORE DETAILED DESCRIPTION

Figure 1 shows different means used by the method of the invention. A program 1 contained in a program memory 2 conditions the working of the microprocessor 3. A dynamic memory 4 stores data elements 5, 6 and 7. These data elements 5, 6 and 7 represent, according to the invention, respectively a country code, an operator code and an LAC-CI code. These data elements 5, 6, 7 are sent by a mobile telephony network 100. The network 100 uses a base station 8 to communicate with the mobile telephone. The network 100 furthermore comprises a base station controller (BSC) 101 responsible for managing a group of base stations. This base station controller 101 is connected to other base stations by a switching

center 102, known as the MSC or Mobile services Switching Center. This mobile services switching center 102 is connected, for example, by a bus 103 controlled by a microprocessor, located in the mobile services switching center 102, to a memory 104. This memory 104 is organized in the form of a correspondence table to store a database. The database is called a VLR or Visitor Location Register. This database is a user temporary identification device. Thus, when a user arrives in a cell covered by a base station controlled by the base station controller 101 connected to the mobile services switching center 102, the database is updated. The updating of the database consists of the placing, in the memory 104, of several identification information elements relating to the user. These identification information elements are stored, in keeping to a correspondence table form of organization, in the memory 104. The correspondence table comprises a certain number of lines or recordings 105. There are as many recordings 105 as identified users. A recording 105 has several fields. It comprises especially a field 106 containing a data element pertaining to a telephone number of a user. It also has a field 107 containing an LAC-CI code. Thus, for each recording, there is a correspondence between a telephone number and an LAC-CI code. The LAC-CI code is the identity of a base station in whose area of responsibility the mobile telephone that can be reached with this telephone number is located. Thus, the identification information corresponding to the data elements 5, 6, 7 is sent by the base station 8 by being picked up in this memory 104.

These data elements 5, 6, 7 are received by the mobile telephone by means of an antenna 9 of this telephone connected with the reception circuit 10. The reception circuit 10 is responsible for converting the electromagnetic signals received at the antenna 9 into binary type of data and also for decoding them. The decoded data elements 5, 6 and 7 are transmitted to the dynamic memory 4 by means of a bus 11, under the control of the microprocessor 3. The microprocessor 3 uses these data elements 5, 6, 7 to find its position in a correspondence memory 12.

The correspondence memory 12 is organized, in a preferred example, as follows. A part of the memory 12 comprises a series of table 13 and 13.1 to 13.n. Each table 13 or 13.1 to 13.n, in one example, is associated with a country. Each table 13 has a certain number of lines or recordings 14. This

number of recordings 14 may be different from one table 13 to another. However, all the recordings 14 of all the tables 13 have the same length.

The recordings 14 are all organized in the same way. A recording 14 has several fields. In a preferred example, a recording 14 has eight fields. These include a field 15 containing a code pertaining to a country. A field 16 contains a code pertaining to an operator. A field 17 contains an LAC-CI code pertaining to an identification and therefore a geographical localization of a base station. A field 18 contains an operator's name. A field 19 contains a country's name. A field 20 contains an information element used to find out whether or not a country defined by the field 19 of the same line possesses several time zones. A binary information element equal to zero means that there is only one time zone and a binary information element equal to one means that there are several time zones. A field 21 contains a piece of information used to find out if the country identified in the field 19 of the same line 14 is subject to the summer/winter time change. For example, a binary information element equal to zero indicates that there is no summer/winter time change in the country identified and a binary information equal to one indicates that there is a summer/winter time change in the country identified. A field 22 contains a piece of information on time difference to be applied. This information on time difference is a function of the identification contained in the fields 15 to 17 of the same recording 14.

With the invention, the size of the memory 12 depends only on the maximum number of countries and not on the number of base stations in these different countries. This number of base stations increases as a function of a number of operators per country.

Furthermore, a location 23 of the memory 12 is reserved in order to keep the date presented.

A different architecture of the memory 12 can be envisaged. In particular, depending on the desired degree of perfection, it may be that certain fields are not represented. Essentially, at least one of the fields 15, 16 or 17 will be present with respect to at least one field 20 to 22 containing a time difference information element. In particular, instead of the fields 15 to 17, the table 12 could contain addresses of memory locations of the recordings 14 of the information needed for the knowledge of the time difference to be taken into account.

The method of the invention works as follows. The microprocessor 3 reads the data element 5 received in the dynamic memory 4. It compares it with the contents of the field 15 of the recordings 14 of the tables. Or else, it addresses the table in the memory with the value of the data element 5. When the microprocessor 3 finds a code in a field 15 equal to the data element received 5, it extracts the name of the country in which the mobile telephone is located. For this purpose, it reads the contents of the field 19 of the line containing this code. On this basis, using the program 1, the microprocessor 3 carries out a test to know whether a piece of information contained in the field 20 of the line contains this code in order to find out if there are several time zones in the country considered. If the answer to the test is negative then, again on the same line, the contents of the field 22 are read, giving a number of hours to be added or deducted from the absolute time contained in a register 24.

The absolute time contained in the register 24 is a reference time internal to the mobile telephone. The user can modify this internal reference time by hand only. This absolute time, in a preferred example, will be a time referenced with respect to the Greenwich meridian, namely Greenwich Mean Time. This is why the microprocessor 3, which has retrieved a time difference value contained in the field 22 by means of a bus 11, adds or deducts this time difference value, coming from the field 22, to or from the absolute time contained in the register 24 and places the result of the operation in a register 25. The microprocessor 3 does not modify the absolute time contained in the register 24. Thus, the time contained in the register 25 is a real time.

This real time is displayed on the screen 26 of the mobile telephone by means of a bus 11 under the control of the microprocessor 3. As a variant, the modified time is not displayed but used internally in the mobile telephone to synchronize the mobile telephone, especially the diary functions, with the time zone in which it is located.

For the recording, a test carried out on a piece of information contained in the field 21, corresponding to a summer/winter time change, gives an indication of whether or not the real time contained in the register 25 has to be modified again. This makes it possible to set the device either to summer time in the summer or to winter time in the winter. The season is

determined by interpreting a date located in the memory location 23. This interpretation is managed by the microprocessor 3 controlled by the program 1. It consists in comparing the current date with time change dates in spring and in the fall. Consequently, the time 27 displayed on the screen 26 corresponds to GMT plus or minus the time difference contained in the field 22 and, if necessary, a change corresponding to summer/winter time.

A user who wishes to manually modify the displayed time 27 will in fact modify the absolute time located in the registers 24. For example, if the user wishes to add an hour manually, then the time displayed 27 will be split up as follows. The displayed time will be the sum of a time difference, defined in a field 22 and the new absolute time contained in the register 24. This new time, for example, will be GMT plus one hour. Now, whatever the country in which the user is located, the time difference contained in the field 22 is located will be added to this new absolute time.

Figure 2 is a geographical representation of two neighboring countries 29 and 30. The country 29 is covered by three time zones 31, 32 and 33 and has a regional presence of three mobile telephony operators 34, 35 and 36. The operator 34 covers a geographical region in the country 30. This region extends within a single time zone 31. The operator 35 covers a geographical region extending over two time zones 32 and 33. The operator 36 covers a geographical region limited to one time zone 33. The country 30 for its part has a single operator 37 and is located in the time zone 32.

When a mobile telephone of a user reaches the country 30, it gets connected to a network covered by the operator 37. This mobile telephone receives identification information elements written in its dynamic memory 4 in the form of data elements 5, 6, 7. Through the data element 5, access is obtained to the name of the country 30 in which he is located. A test on the information contained in the field 20 of the line containing the name of the country 30 will indicate the fact that this country is covered by a single time zone and, in this case, this information element is equal to zero. In this case, the time difference to be applied to the absolute time is immediately deduced by reading the value contained in the field 22 of the line 14 corresponding to the name of the country 30.

By testing the information contained in the field 21, it will be known whether, in this country 30, it is necessary to apply a summer/winter time

change. If this is the case, the information has the value 1. The microprocessor 3 is used to read the real time contained in the register 25 and the date contained in the memory location 23. It is thus possible to determine which is the right time to be displayed on the screen 26.

If the user goes to the country 29, his mobile telephone will get connected for example with the network of the operator 35. The network will send identification information which the mobile telephone will place in the dynamic memory 4 in the form of data 5, 6, 7. This data will enable him to determine the time difference in this country or more generally in this region. In this case, the test on the information contained in the field 20 of the line 14 containing the name of the country 29 indicates the presence of several time zones 32 and 33 in the country 29. The information contained in the field 20 is therefore equal to 1. In this case, the country code equal to the data element 5 will no longer be enough to determine the time difference. It is therefore necessary to use a complementary data element, namely the data element 7 used to geographically locate a base station inside the country 29.

Thus, in a table 13 corresponding to the country 29, a search is made to find out which is the line 14, among all the lines possible for the country 29, that contains a piece of information, in the field 17, equal to the data element 7. Once this line has been found, the same operations as above are repeated. This means that the value of the time difference contained in the field 22 of this line 14 is read and then the information contained in the field 21 of this line 14, pertaining to a summer/winter change, is tested. The time difference thus computed is added, in the register 25, to a copy of the absolute time contained in the register 24. The identification of the base stations will be such that at least one of the arguments of the codes LAC-CI of the base stations located in the time zone 33 is different from an argument for the same type of base station located in the time zone 32. If, instead of being connected to the operator 35, the mobile telephone were to be connected to the operator 36, there would be a data element 7 with which an identical time difference would have been associated, whatever the base station. Indeed, the surface area covered by this operator 35 is contained in a single time zone 33. This would also be the case if the connection had taken place with the operator 34 located in a region covered by a time zone 31, except that the time zone would not have been the same.

Figure 3 shows a view, in algorithmic form, of different steps of the method according to the invention. A first step 38 is for a reading of the data elements 5, 6, 7 relating to identification information received by the mobile telephone and written in the dynamic memory 4. This information is used by the microprocessor 3, controlled by the program 1, to make a search during a step 39 for the beginning of the table 13 or 13.1 to 13.n containing a country code equivalent to the data element 5. This data element 5 is compared with values contained in the field 15.

Once the table 13 associated with the identified country has been found, a first test 40 is performed in order to find out if the country is covered by several time zones. The tested information is a piece of information contained in a field 20 of the first line 14 a table 13. This information is the same for all the lines of one and the same table.

If the result of the test 40 is positive, a step 41 is reached. During this step 41, a search is made, in the table found, for the line 14 in which the contents of the field 17 are equal to the data element 7. If the result of the test 40 is negative, this step 41 is circumvented.

Then, once a line 14 has been selected, a reading is made, during a step 42, of the contents of the field 22 of this line 14 which contains a time difference to be applied. The time difference to be applied is added directly to the absolute time contained in the register 24.

In a new test step 43, the information contained in the field 21 of the line 14 is tested. Thus, it is known whether the country identified is concerned by a change in summer/winter time. If the result of the test is positive then, in a step 44, the current date is read at the memory location 23 and the real time is read in the register 25. Then, in a step 45, the real time is adjusted accordingly. This means that the real time is modified depending on whether it is summer time or winter time. In the case of a negative test result, the steps 44 and 45 are circumvented and there is a return to the step 46 during which the real time contained in the register 25 is displayed on a screen 26. During a step 47, the name of the country identified is displayed as a function of the value read in the field 19 of the line 14.

Instead of using information sent in the broadcasting channel BCCH by the network, especially during a connection, it is also possible to consider sending this identification information in using a standardized short message

service or SMS. In this case, a time difference information element to be applied can be sent directly to the mobile telephone, depending on the place in which the mobile telephone is located. In a preferred example, an activation of a dispatch of the time difference information is ordered by the network which is responsible for managing the itinerancy of a user. A case could also be envisaged where this activation is ordered by the mobile telephone, for example when it receives a new LAC-CI code.

Thus, a field 108 is added to each recording 105 in the memory 104. This field 108 therefore contains a measurement of a time zone in which the mobile telephone is located. Indeed, this time difference depends on the geographical location of the base station. The switching center 102 connected to the memory 104, for example by a bus 103, gives this time zone measurement to the base station 8 by means of the base station controller 101. The base station 8 sends this information on time zone measurement, in addition to the previous information on identification, to the mobile telephone. Thus, the data memory 4 of the mobile telephone, in this case, has an additional data element 109 on the time difference to be applied to the absolute time contained in the register 24. The result is placed in the register 25 containing the real time which corresponds, inter alia, to the time 27 displayed on the screen 26 of the mobile telephone. The immediate consequence of this is that the size of the correspondence memory 12 in the mobile telephone is reduced. Indeed, the correspondence memory 12 of the mobile telephone must contain all the codes of the operators of all the countries as well as the names of operators and countries and LAC-CI codes. If, furthermore, this measurement is modified in taking account of a possible summer/winter time change, then the correspondence memory 12, which previously occupied a fairly cumbersome amount of space, is completely eliminated from the mobile telephone.

In another variant, instead of using the short message service or SMS, the data is sent on a broadcasting frequency channel conveying messages which shall hereinafter be called SMS-CB. This frequency channel is known as the CBCH or Cell Broadcast CHannel. The CBCH channel is the channel that is used to broadcast information, especially weather or automobile traffic information, in the form of SMS-CB messages for several users. SMS-CB messages are messages intended for all mobile telephones in one and the

same geographical region. This geographical zone has either a cell controlled by a base station or several cells each controlled by a base station. All the base stations of this geographical region send identical SMS-CB messages and do so in one and the same frequency channel CBCH. In this case, the management method in the network is further simplified since information is sent on a broadcasting channel, which is therefore accessible to all the users in one and the same geographical region, and is no sent longer on a channel dedicated to a single user. Thus, any user who is in a geographical region receives, on the initiative of the network and the mobile telephone, a piece of information on time zone measurements. This dispatch is done either at a specified date or when the user goes from a geographical region covered by one time zone to a geographical region covered by another time zone.